Ophioglossaceae.—CAMPBELL[22] has published an account of his studies of East Indian species of Ophioglossum. He collected *O. moluccanum*, *O. intermedium*, and *O. pendulum*, securing both gametophytes and sporophytes in considerable number. The spores of *O. moluccanum* germinated freely, but owing to a failure to become associated with the mycorhizal fungus the prothallia died after reaching the four-celled stage. Prothallia of *O. pendulum* made the mycorhizal connection and reached the thirteen-celled stage. They did not develop any chlorophyll on exposure to light, although a few chloroplasts developed in the prothallia of *O. moluccanum*. The adult gametophyte in all the species studied is subterranean, without chlorophyll, and radiate in structure. CAMPBELL'S account agrees closely in this regard with the accounts of METTENIUS, LANG, and BRUCHMANN. The account of the development of the antheridium is also essentially the same as that given by these authors. The statement is made that in the mitosis immediately preceding the formation of sperms the number of chromosomes is much larger than in the earlier divisions. Most cytologists will regret that this interesting situation was not investigated somewhat further. The development of the sperm agrees closely with that of Equisetum. The archegonia resemble those of the Marattiaceae. There is either a binucleate neck canal cell or two neck canal cells. The ventral canal cell is difficult to demonstrate, but was shown to be present in *O. pendulum* and probably in the others. The primary wall in the embryo is transverse in most cases, but varies considerably, particularly in *O. pendulum*. The entire hypobasal half goes to the formation of the foot. There are three types of embryo: (1) that of *O. moluccanum*, in which only root and leaf are developed, the plant being annual and no stem being produced; (2) that of *O. vulgatum*, in which root and stem are first produced, and much later a leaf; and (3) that of *O. pendulum*, in which root only is produced, stem and leaf arising later by means of an endogenously developed bud from the primary root at some distance from the gametophyte; the vascular bundles of leaf and stem arise separately from the bundle of the root and remain separate.

In *O. moluccanum* the primary root is monarch and the bundle of the leaf is collateral, and CAMPBELL says that it is merely a question of terms whether one calls the root monarch or collateral. The primary root of *O. pendulum* is diarch, as are also the later roots. The *O. moluccanum* type of embryo is probably the most primitive and is most nearly related to the embryos of Marattiaceae and Equisetineae, especially to the former. The author's well-known claim that Ophioglossum is a primitive type of pteridophytes is emphasized by his somewhat detailed explanation as to how the *O. moluccanum* type might have arisen from an Anthoceros-like ancestry.—L. LANCE BURLINGAME.

Sterility in hybrids.—TISCHLER[23] has published a preliminary account of further investigation on the causes of sterility in hybrids. He has studied *Potentilla*

[22] CAMPBELL, D. H., Studies of the Ophioglossaceae. Ann. Jard. Bot. Buitenzorg II. **6**:138–194. *pls. 9–19.* 1907.

[23] TISCHLER, G., Weitere Untersuchungen über Sterilitätsursachen bei Bastardpflanzen. Ber. Deutsch. Bot. Gesells. **25**:376–383. 1907.

Tabernaemontani×*P. rubens*, *Syringa vulgaris*×*S. persica*, and Mirabilis forms including *M. Jalapa*×*M. tubiflora* and *M. Jalapa*×*M. longiflora*. In some of these the usual irregularities in the reduction mitoses of sterile hybrids are reported. In *Potentilla Tabernaemontani*×*P. rubens* the *x* number of chromosomes is 16. The hybrid shows no difference from the parent *P. Tabernaemontani* in pollen formation, except that the former produces a larger number of imperfect pollen grains. In *P. rubens* nearly all the pollen grains are good. The latter is a constant species, while the former is very variable or "mutable." By subjecting this hybrid to etiolation in hothouse temperature, complete sterility was produced. The reduction divisions were apparently normal, but there was a lack of cytoplasm and of chromatin, the scarcity of the former beginning as early as the archesporium stage. Similar but less marked results were obtained by subjecting *P. rubens* to the same conditions. Some of TISCHLER'S interesting conclusions, which will be further discussed in the forthcoming paper, may be briefly stated as follows: (1) Sterility of hybrids does not depend upon any form of chromatin repulsion. (2) Sterility results from the fact that two sexual cells are thrown together whose developmental tendencies are not identical. When the individual reaches the critical reproductive stage the disturbance of harmony in its development makes itself apparent. (3) By modification of the external conditions in plants which are not hybrids, the sexual cells may be so influenced as to produce conditions similar to those which result from hybridization. (4) The sterility of hybrids is a purely relative matter. (5) A true splitting or segregation of characters does not occur in the reduction divisions. One of the arguments in support of this conclusion is that certain characters Mendelize which concern not single rudiments but the constitution of the whole of the idioplasm. (6) The assumption that the individual characters are connected with distinct and separated pangens is abandoned. (7) The chromatin is not of exclusive significance as a hereditary substance. (8) There is a specific idioplasm having a definite constitution. (9) A distinction is to be maintained between chromatin and linin. (10) Apogamy is merely an aid in reproduction in cases of pollen sterility, and is not the primary condition to which pollen obliteration is secondary. (11) Similarly, as shown by CORRENS, in species which are passing from the monoecious to the dioecious condition, disturbances similar to those of mutation occur, resulting in contabescence of the anthers or ovaries. (12) There is, as DARWIN believed, a close relation between the sterility of hybrids and that of plants under cultivation. The full account of this work will be awaited with interest.—R. R. GATES.

Anatomy of Araliaceae.—A very comprehensive treatment of the Araliaceae has been published by VIGUIER,[24] dealing with the history of the family, the external morphological characters, and the internal structure of stem and leaf of about sixty genera. Besides being a valuable contribution to the knowledge of plant anatomy in general, the paper offers an excellent proof of the importance of ana-

[24] VIGUIER, RENÉ, Recherches anatomiques sur la classification des Araliacées. Ann. Sci. Nat. Bot. IX. 4:1–208. 1906.